



2015 Site Visit Briefing



Woods Hole Sea Grant Program



Agenda

Monday, April 13, 2015


Arrive at Inn on the Square, Falmouth, MA

Tuesday, April 14, 2015

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| 0830 | Pick-up at Inn on the Square for transport to WHOI, Carriage House |
| 0900 | Introduction to Woods Hole Sea Grant Program, Judith McDowell, Director
Diane Murphy, Marine Extension Leader
Greg Berman, Coastal Processes Specialist
Jeffrey Brodeur, Communications and Outreach Specialist |
| 1030 | Team meets with Dr. Laurence Madin, WHOI Executive Vice President and Director of Research and William Clark, Director, Cape Cod Cooperative Extension |
| 1130-1200 | Meeting with MOGG Members |
| 1200-1300 | Lunch and informal discussion with staff and poster presentations on Healthy Coastal Ecosystems |
| 1300-1430 | Sustainable Fisheries and Aquaculture Panel, led by Diane Murphy |
| 1430-1445 | Break |
| 1445-1615 | Resilient Communities and Economies Panel, led by Greg Berman |
| 1615-1700 | Team Executive Session |
| 1730-1900 | Woods Hole Sea Grant Reception, WHOI Exhibit Center, Team, Staff, Advisory Board, Researchers, Students |
| 1900 | Return to Inn on the Square |

Thursday, April 15, 2015

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| 0830 | Pick-up at Inn on the Square for transport to WHOI, Carriage House |
| 0900-1030 | Environmental Literacy and Workplace Development Panel, led by Jeffrey Brodeur |
| 1030-1300 | Team Executive Session with lunch |
| 1300-1400 | Debriefing |
| 1400-1500 | Final Executive Session |
| 1500 | Return to Inn on the Square or Airport |



Introduction

Sea Grant's legislative charge is to "increase the understanding, assessment, development, utilization, and conservation of the nation's ocean and coastal resources by providing assistance to promote a strong educational base, responsive research and training activities, and broad and prompt dissemination of knowledge and techniques." The Woods Hole Sea Grant Program based at the Woods Hole Oceanographic Institution (WHOI), supports research, education, outreach, and extension projects that encourage environmental stewardship, long-term economic development, and responsible use of the nation's coastal and ocean resources.

Woods Hole Sea Grant's affiliation with WHOI began in 1971 with support for several individual research projects. In 1973, WHOI was designated a Coherent Sea Grant Program and, in 1985, was elevated to its current status as an Institutional Sea Grant Program. The Woods Hole Sea Grant Program channels the expertise of world-renowned ocean scientists toward meeting the research and information needs of users of the marine environment. Public and private institutions throughout Massachusetts, and collaborators outside of Massachusetts, participate in the Woods Hole Sea Grant Program. The current strategic plan—*Woods Hole Sea Grant in the 21st Century: A Strategic Assessment of Issues and Opportunities, 2014-2017*—represents the collective concerns of the Massachusetts coastal community at all levels. It highlights important coastal issues and research needs, suggests investigative approaches, and proposes research-based outreach programs. Perhaps most importantly, this plan serves as a catalyst for creative thinking and identifying new opportunities. The plan is used as a guideline for program planning and establishing program objectives.

Program Management and Organization: Leadership and Institution Setting

The Woods Hole Sea Grant Program is situated within the Biology Department at WHOI, which is the home department of the director, Dr. Judith E. McDowell. The program reports directly to the Executive Vice President and Director of Research of WHOI, Dr. Laurence P. Madin. Woods Hole Sea Grant has a small staff, but works collaboratively with other staff at both the Woods Hole Oceanographic Institution and the Cape Cod Cooperative Extension Service. By sharing staff for fiscal and administrative management within the two larger organizations, personnel support for Woods Hole Sea Grant is focused on research, education, outreach, and extension programs. Financial and administrative assistance are provided at WHOI through the Biology Department and Grants and Contract Services. All of these administrative functions are supported through WHOI overhead. Similar services are provided at Cape Cod Cooperative Extension through Barnstable County funded positions. In addition, WHOI's Communications Department assists in publication preparation, teacher workshop facilitation, and other outreach activities. Thus, through effective partnerships at WHOI and CCCE, Woods Hole Sea Grant's small staff leverages the expertise and talent available throughout the parent organizations and extends opportunities throughout the Commonwealth of Massachusetts.

An organizational chart of staffing for Woods Hole Sea Grant is presented in Figure 1. Staff biographies are presented in the Appendix. Each Woods Hole Sea Grant staff member contributes to the overall planning of every facet of the program and participates in extension, communications, education, and outreach programs. Through this team approach, we are able to design workshops, media placements, and other outreach activities with the full suite of Sea Grant activities in mind. Judith McDowell (0.5 FTE) serves as program

Figure 1. Woods Hole Sea Grant staffing.

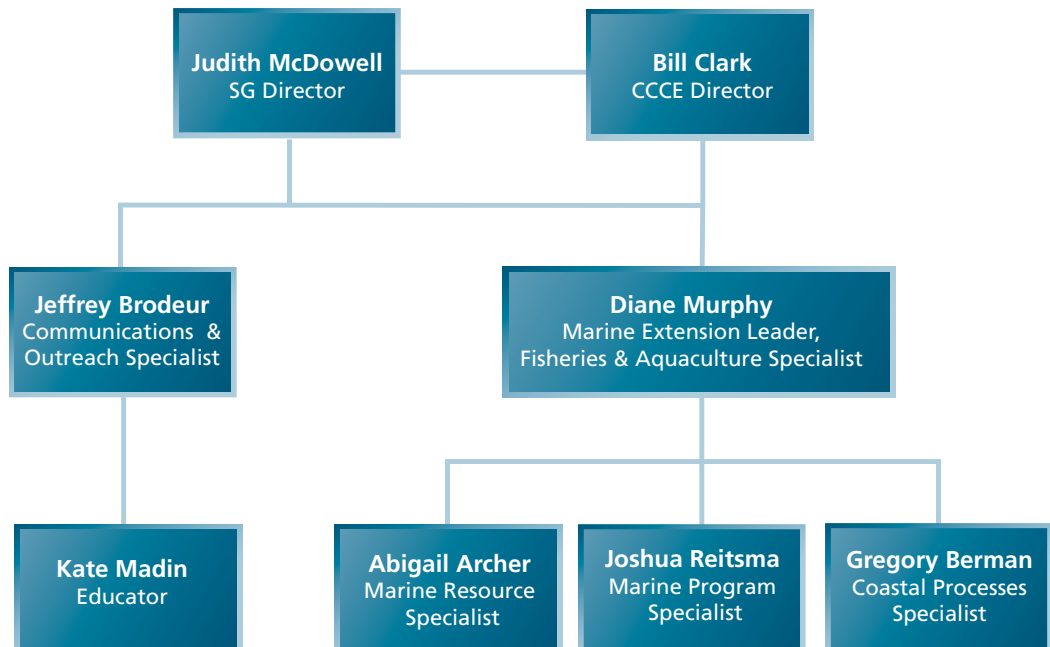
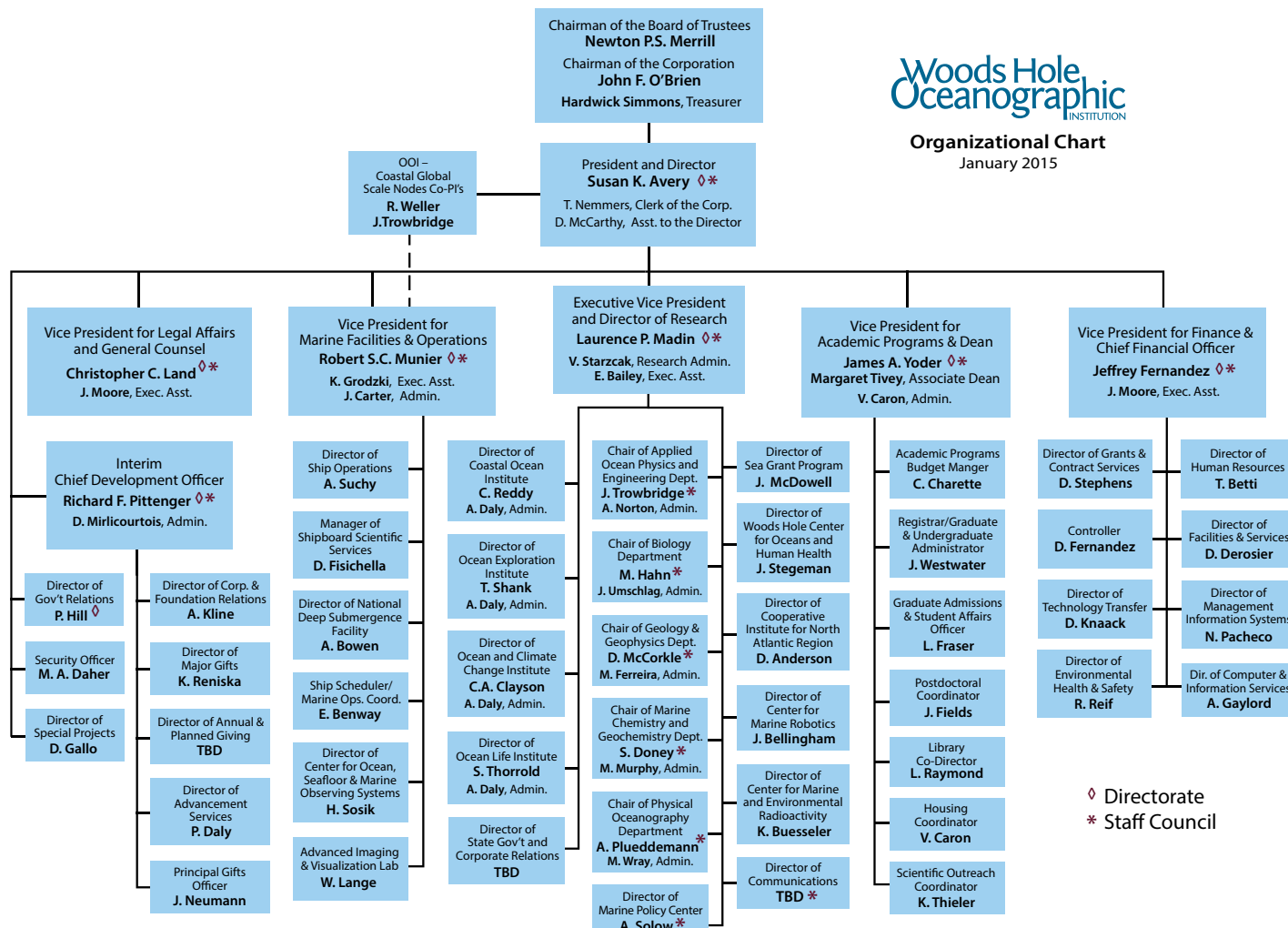


Figure 2. WHOI Organizational Chart



director and oversees all aspects of the program. Jeffrey Brodeur (1.0 FTE) is the Communication and Outreach Director, and serves as the deputy administrator in Dr. McDowell's absence. Diane Murphy (1.0 FTE) is the Marine Extension Leader and Fisheries and Aquaculture Specialist. Kate Madin (0.5 FTE SG and 0.5 FTE WHOI Communication) is the program educator responsible for all K-12 activities, in addition to her responsibilities as a writer for *Oceanus* magazine. Additional extension staff includes Greg Berman (1.0 FTE), Coastal Processes Specialist, Joshua Reitsma (1.0 FTE), Marine Program Specialist and Abigail Archer (1.0 FTE), Marine Resource Specialist. The entire Woods Hole Sea Grant team has regular planning meetings to review all program activities. Thus, there is close cooperation and awareness of all components of the program.

WHOI's Organizational Chart is presented in Figure 2. As Sea Grant Director, Dr. McDowell has direct input to other research activities at WHOI including departmental programs; WHOI's four interdisciplinary institutes; the NOAA Cooperative Institute for the North Atlantic Region (CINAR); and the Woods Hole Center for Oceans and Human Health (COHH). Through each of these partnerships, Woods Hole Sea Grant has co-sponsored research programs, workshop activities, and outreach programs. This has led to collaborative projects addressing shore-line change, harmful algal blooms, oil spill response in the Gulf of Mexico, and ocean acidification.

Cape Cod Cooperative Extension is the education and outreach department for Barnstable County. CCCE educates the public on topics as diverse as deer ticks and Lyme disease, water quality, aquaculture, agriculture, and coastal erosion. Staff plans and conducts programs based on local needs and interests. Volunteer advisory groups work with staff on developing specific programs. Local citizens, appointed by the County Commissioners, serve as County Extension trustees, advising the overall program. The Extension staff serves as a direct link with the University of Massachusetts and the Woods Hole Sea Grant programs, where new research findings are translated into practical applications to be shared with people and community officials through workshops, conferences, field demonstrations, technical assistance, newspaper articles, radio and television, and the Internet. Publications, such as regular newsletters, and booklets, fact sheets, and home study courses bring information directly to those who want and need it. Over 450 volunteers complement and extend staff efforts, contributing their time and expertise to Extension in Barnstable County. Director Bill Clark serves both advisory and management roles within Woods Hole Sea Grant in many aspects of outreach and extension programs.

Table 1. Marine Outreach Guidance Group Membership

NAME	ORGANIZATION
Andrew Cummings	Shellfish Grower
Shelley Dawicki	NOAA /NMFS Northeast Fisheries Center
Pat Hughes	Center for Coastal Studies
John Farrington	WHOI Scientist Emeritus and UMASS-Dartmouth
Mike Fogarty	NOAA/NMFS Northeast Fisheries Center
Rick Karney	Martha's Vineyard Shellfish Group
Ted Keon	Town of Chatham
Jim Mahala	Massachusetts DEP
Steve McKenna	Massachusetts CZM
Cheryl Milliken	Teacher, Town of Falmouth
Judith Pederson	MIT Sea Grant
Heinz Proft	Town of Harwich
Christopher Schillaci	Massachusetts Division of Marine Fisheries
Rob Theiler	USGS
Mindy Todd	WCAI /WNAN, Cape and Islands NPR
Megan Tyrell	Cape Cod National Seashore
Rob Vincent	MIT Sea Grant
Chris Weidman	Waquoit Bay National Estuarine Research Reserve

Program Management and Organization: Advisory Board

The Marine Outreach Guidance Group (MOGG) is the advisory group for Woods Hole Sea Grant and includes members from academia, industry, the public media, and government agencies. The advisory group provides input on research programming, extension activities, legislative interactions, media activities and all other aspects of the Woods Hole Sea Grant program. Current membership of MOGG is listed in Table 1. The group meets annually and provides recommendations and oversight of research, communications and outreach and extension activities. Subcommittees of MOGG meet more frequently to advise on specific extension and outreach projects.

Program Management and Organization: Recruiting Talent

Consistent with the goals of NOAA Sea Grant's National Strategic Plan, Woods Hole Sea Grant focused its program for 2014-2017 on four major theme areas: (1) Healthy Coastal Ecosystems, (2) Sustainable Fisheries and Aquaculture, (3) Resilient Communities and Economies, and (4) Environmental Literacy and Workplace Development.

The strategic planning process for Woods Hole Sea Grant engages stakeholders throughout the Commonwealth of Massachusetts. The program plan builds on the national plan, but also focuses on issues that are of greatest importance to Massachusetts. In developing this plan, consideration was given to scientific merit, degree of community concern, relevance to the National Sea Grant College Program goals, opportunity for inter-agency collaboration, and degree of public benefit. Issues and opportunities were also assessed on the basis of their relevance to other agency goals and strategic plans. To guide the development of strategic plans for both Woods Hole Sea Grant and MIT Sea Grant, the two programs issued a joint survey soliciting input on issues of concern from coastal scientists, managers, regulators, and business and environmental group representatives throughout the Commonwealth of Massachusetts, in addition to partner organizations throughout Northeast U.S. The plan developed by Woods Hole Sea Grant was also informed by stakeholder input from the communities that Woods Hole Sea Grant serves in Southeastern Massachusetts, and from needs assessments conducted for the NOAA sponsored Coastal Training Program (CTP) at Waquoit Bay National Estuarine Research Reserve (WBNERR). The CTP is a partnership between WBNERR, the Massachusetts Office of Coastal Zone Management, and Woods Hole Sea Grant. The survey issued by Woods Hole Sea Grant and MIT Sea Grant was sent to our respective list serves SEMCO and NEMCO, and posted on our respective program websites and on the Massachusetts Office of Coastal Zone Management monthly calendar and website.

The proposal solicitation process for Woods Hole Sea Grant begins with the mailing of a general announcement and call for pre-proposals to all colleges and universities, non-profit marine research institutions, and other non-profit groups in the Commonwealth of Massachusetts. The announcement of pre-proposal solicitation is also posted on the Woods Hole Sea Grant website and is listed in the Massachusetts Coastal Zone Management monthly calendar and state newsletter. A general information meeting on the application process is held in Woods Hole and all aspects of the proposal process, deadlines, and cost share requirements are discussed. We coordinate the scheduling of pre-proposal and proposal solicitation with all of the Northeast Sea Grant Programs to encourage regional collaboration.

On average the Woods Hole Sea Grant Office receives between 50 and 60 pre-proposals for each RFP. A panel of technical and extension specialists review and rank all pre-proposals and make recommendations for which pre-proposals should be developed for full proposal submission. In addition to judging appropriateness of individual pre-proposals for Sea Grant support and fit with the strategic plan, the review committee also attempts to identify potential opportunities for matching funds, opportunities for students, outreach aspects of individual projects, and potential linkages between different projects and principal investigators. Opportunities for collaborations with projects supported by other Sea Grant programs in the Northeast are also identified.

Between twenty and twenty-five full proposals are requested during most funding cycles and are sent to five external reviewers for evaluation. Peer reviewers are contacted prior to sending the proposal to ensure that each reviewer can provide a timely and objective review. Each peer reviewer is also asked to confirm in writing that no conflict of interest with the principal investigator(s) exists. While the proposals are undergoing peer review, Sea Grant staff also review the projects for completeness, cost sharing, and budget justification. A review pack-

Table 2. Proposal Statistics for Woods Hole Sea Grant, 2010 through 2015.

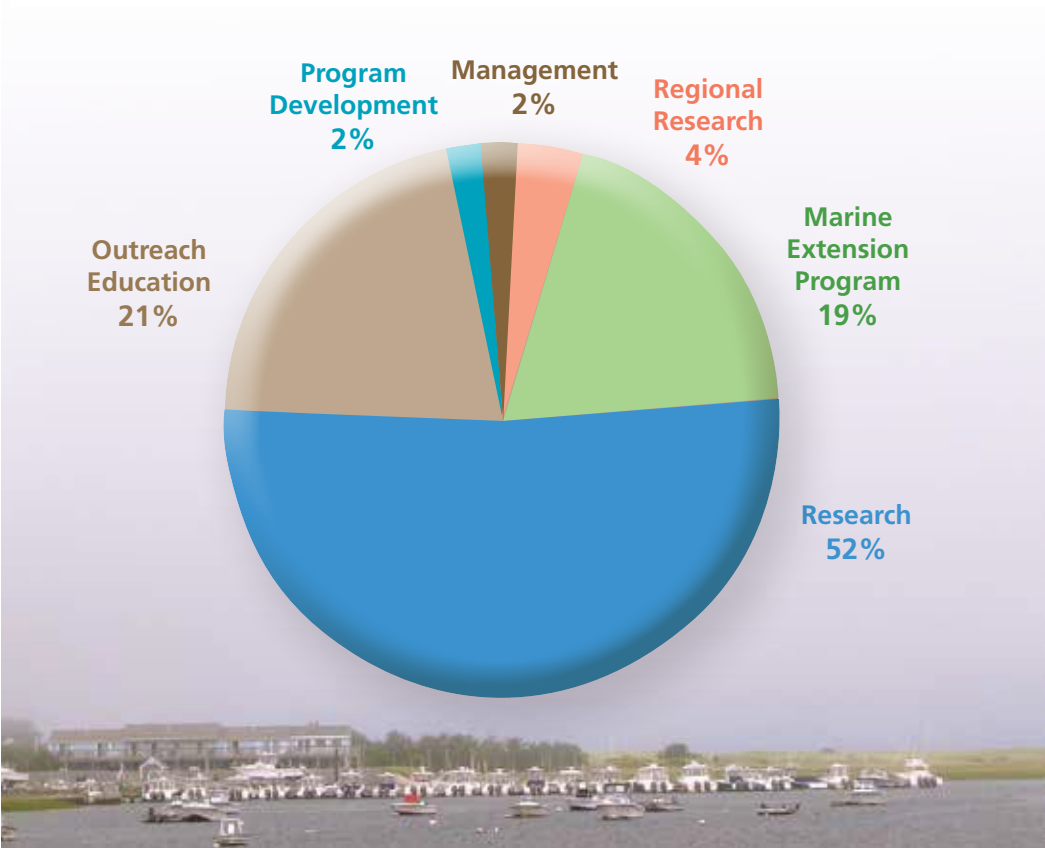
	2010–2012	2012–2014	2014–2016
Pre-proposals Received	52	50	58
Home / Other	21 / 31	20 / 30	27 / 31
No. of Institutions	15	18	22
Full Proposals Invited	22	21	24
Home / Other	21 / 10	11 / 10	14 / 10
No. of Institutions	11	14	20
Full Proposals Funded	11	11	13
Home / Other	6 / 5	7 / 4	8 / 5
No. of Institutions Supported	9	12	19
No. of New Investigators funded	9	6	5
New / Continuing Projects	9 / 2	9 / 2	11 / 2
#NESGC regional proposals funded	2	2	2
(managed by WHSG)	(2)	(2)	(2)
No. of NSI Proposals Funded¹	-	3	2
Students Supported (UG / G)	1 / 7	6 / 15	3 / 9
Knauss Fellows	3	3	4

¹ Includes proposals supported by the Social Sciences NSI, Aquaculture Extension NSI, and Aquaculture Research NSI.

et is sent to individual investigators including anonymous mail reviews. Principal investigators are asked to provide responses to reviewers' comments and suggestions, but are not allowed to alter the proposal. A Proposal Review Panel determines the final selection of proposals to be included in the Omnibus Proposal. Composition of the review panel includes technical experts in fisheries biology, coastal ecology, ocean engineering, and marine policy, in addition to membership from our advisory board (MOGG), an extension staff member, and the MIT Sea Grant director. Final decisions are based on technical merit and relevance to strategic plan objectives, and linkages with extension and outreach projects are recommended.

Table 3. Budget Breakdown of Woods Hole Sea Grant Core Budget, 2010-2015

Program Component	2010	2011	2012	2013	2014	2015
Management	\$51,750	\$78,495	\$7,496	\$7,496	\$4,992	\$0
Marine Extension Program	161,479	189,031	188,191	191,176	218,424	212,645
Outreach & Education	196,299	203,325	216,089	225,284	237,094	237,102
Research	512,231	442,264	538,092	494,458	608,438	643,512
Regional Research	62,525	62,525	25,000	25,000	44,845	44,970
Program Development	5,716	13,361	15,181	13,786	43,456	19,110





Nauset Marsh, home to a WHSG-funded project on the distribution of *Alexandrium fundyense* cysts.

Proposal statistics for the last three Omnibus proposals are presented in Table 2. Budgetary breakdown of the Woods Hole Sea Grant core budget, 2010-2015, is presented in Table 3 and Figure 3. During the 2014-2016 funding cycle, the Woods Hole Sea Grant Program is supporting 17 concurrent research projects (including three regional projects supported by the Northeast Sea Grant Consortium and one project supported by the Aquaculture NSI). Current Research projects are described in the 2014-2016 Program Guide.

Even though the budget of the Woods Hole Sea Grant program is small, we efficiently leverage our federal dollars to support robust research, extension and outreach programs. With leveraged dollars for management, extension and outreach from multiple sources of funds for the non-research components of the program, we can support a rich research portfolio. Research dollars are also leveraged, as many of the projects supported by Woods Hole Sea Grant are seed projects that develop into larger initiatives with a three to five fold increase in dollars from other federal agencies. As an example, Woods Hole Sea Grant supported Don Anderson's laboratory to investigate the distribution of *Alexandrium fundyense* cysts in the Nauset marsh in a two-year project at a total of \$150,000. Results from that study indicated that sediments in Nauset marsh are an important reservoir of cysts for the organism responsible for harmful algal blooms along the New England coast. These results led to a major award from NOAA's Coastal Ocean Program to test different ways of removing cysts from bottom sediments and an MIT Sea Grant supported project for deployment of two automated biosensors—*Imaging FlowCytobot (IFCB)* and *Environmental Sample Processor (ESP)*—to capture complementary data streams to provide a continuous record of the complete bloom cycle of *Alexandrium fundyense* in the Nauset Marsh ecosystem.

Stakeholder Engagement

The Woods Hole Sea Grant Extension Program (WHSGEP) shares with the Woods Hole Sea Grant Outreach and Education Program (WHSGOEP) the responsibility for providing technical assistance to users of our nation's and in particular our region's marine and coastal resources while promoting the objectives of wise utilization and conservation of those resources. The special mission of Sea Grant extension, as discussed in *Fundamentals of a Sea Grant Extension Program*, is to develop reciprocal relationships between resource users/managers of those

resources and technical information producers to (1) facilitate solution of practical marine resource-related problems by providing access to technical information; and (2) identify the real world problems facing resource users/managers for research scientists and engineers. WHSGEP focuses its attention on the marine and coastal resource users/managers in Massachusetts' coastal communities, particularly in southeastern Massachusetts, and emphasizes the application of research in the social and natural sciences to coastal resource issues.

The extension program is primarily directed toward applied research, technology demonstration projects and transfer, and public outreach to those concerned with coastal and marine resources in southeastern Massachusetts, including Plymouth, Barnstable, Bristol, Dukes and Nantucket Counties. This region encompasses a variety of coastal villages, cities, and natural areas, including salt marshes, barrier beach/sand dune systems, estuaries and open ocean habitats. This rich mixture of terrestrial and marine environments and their associated uses by humans presents a broad array of technical problems in need of solutions. The primary economic base for the region consists of housing, tourism, wild marine fisheries and aquaculture-related industries, light industry, and marine research and instrumentation associated businesses. Given these attributes, the extension focuses on (1) fisheries and aquaculture and (2) coastal processes and hazards. In addition, the extension program maintains a large base of information relevant to the region and is in the position to answer most of the questions and requests for information that are posed to all of the Woods Hole Sea Grant staff.

The development of the WHSGEP is guided and its progress monitored by MOGG in addition to smaller distinct advisory groups often including members from MOGG and the advisory board for the Southeastern Massachusetts Aquaculture Center (SEMAC). In response to community needs and MOGG recommendations, WHSGEP (1) contributes to the technical information required to help local natural resource managers and harvesters manage the fisheries resources for continued sustainable production; (2) assists the regional aquaculture industry as a growing contributor to the local economy and to the national and global production of farmed marine products in an environmentally sustained manner; (3) promotes healthy diversified natural ecosystems and their long-term sustainable management through science-based decisions; and (4) assists coastal resource managers, property owners, and the general public in making informed, effective decisions that contribute to maintaining the beneficial functions of coastal landform systems through an understanding of coastal processes and hazard mitigation research.

Extension staff contributes to several state-wide and regional efforts including the Southeastern Massachusetts Aquaculture Center (SEMAC), USDA's Northeast Regional Aquaculture Program, the Barnstable County Shellfish Advisory Group, the Northeast Aquaculture Extension Network, the Massachusetts Shellfish Officers Association, NOAA's River Herring Technical Working Group, the Massachusetts Hazard Mitigation Interagency Committee, the Rapid Response Coastal Storm Damage Assessment Team, the Barnstable County Coastal Resources Committee, and the National Weather Service Marine Advisory Board.



Local shellfish grower checks his grant.

Development along Cape Cod Bay, such as this Town Neck area of Sandwich continues to be a concern.



Living Marine Resources

More than 340 shellfish growers are distributed throughout the Massachusetts coastline—collectively utilizing over 1,000 acres for their farming operations that exceed \$12 million in yearly revenues. As this local industry continues to grow, stakeholders continually seek technical assistance germane to their operations that WH SG provides through (1) courses, lectures, and workshops; (2) regional shellfish disease monitoring; (3) site visits to farms experiencing any one of a myriad of possible issues; (4) predator/pest identification and advice on their control; (5) gear issues; and (6) water quality monitoring.

Quahog growth studies results.

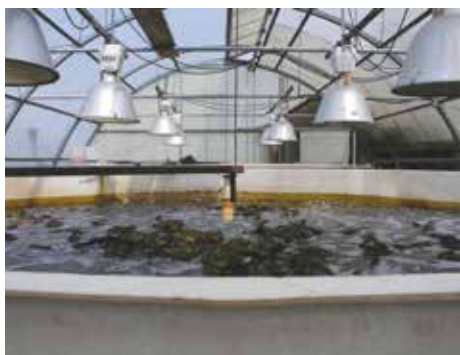
Human illness related to *Vibrio* bacteria from consumption of raw shellfish is one of the most recent issues to arise. In response, State regulators applied new shellfish management regulations to decrease risk of illness.



WH SG staff attended meetings with regulators and provided input to help inform management decisions. Additionally, WH SG initiated research to learn more about *Vibrio* (specifically *Vibrio parahaemolyticus*) characteristics under varying temperature regimes and times of exposure. These studies included collaboration with other researchers; results were shared among all stakeholders either individually, or through public meetings and at several conferences.

The State's coastal waters are also the source for commercial and recreational shellfish harvest activities. As such, these resources are managed by each town and often enhanced through shellfish propagation efforts. In this capacity, WH SG staff manages a yearly municipal shellfish propagation program whereby towns participate in a group bid process to reliably obtain clam and oyster seed and at the best price. These collaborative efforts have netted the towns millions of seed that enhance natural resources locally and provide an economic and food resource for harvesters.

WHSG staff worked with a land-based aquaculture producer to evaluate production of a high value marine shrimp in Massachusetts. Assistance was also provided to several municipalities considering shellfish as a part of a nitrogen management plan through data and technical advice. Staff also worked with local fishermen to evaluate potential markets for invasive and problematic



Oyster remote set tank at local hatchery prepares to introduce "eyed" oyster larvae.



Visible oyster spat in remote set bag from municipal propagation efforts.



WHSG project to investigate performance between different oyster gear types.

green crabs and worked with shellfish commercial industry and regulatory partners to develop local shellfish handling and safety educational material.

Cape Cod and Southeastern Massachusetts have approximately 60 herring runs—rivers in which two species of fish known as ‘river herring’ migrate upstream from the ocean to spawn. Since colonial times Massachusetts towns have appointed river herring wardens to regulate harvest and keep the river free of obstructions. In 2006 the Massachusetts Division of Marine Fisheries prohibited harvest in response to declining populations. In the past wardens had little need to seek information outside of their watershed. Now to participate in state and regional decision-making, it is useful to discuss management decisions among the different groups, and have an understanding of current research and policies. Abigail Archer coordinates a network of town river herring managers, manages a high traffic website www.riverherringnetwork.com, and in 2013 organized a forum for 50 people to discuss current research and management. In 2014, 61 people gathered for the 4th annual meeting representing 18 different towns, five state agencies, four non-profits, and the NOAA Office of Habitat Restoration.



River Herring Network field trip to restoration site.

Coastal Processes

Massachusetts is a “home-rule” state, with local town officials often being the first and last permitting agency for projects within 100 feet of the coastline. Many of these officials managing the coastline do not have the background to deal with projects impacting coastal processes, may not look past town boundaries, and may overlook cumulative effects. Each year dozens of coastal dunes and coastal banks are threatened by projects that could degrade their functions. In 2014 alone WHSG’s pre-consultation process on 25 projects helped local coastal managers ensure that the natural and beneficial functions of coastal landforms were sustained. The combined assessed value of the properties that were evaluated to make sound management decisions was over \$122,500,000. Other direct outreach to more than 1,100 individuals has been made through presentations on coastal processes to different groups. The Coastal Processes specialist provided



Coastal development, Stage Harbor, Chatham.



A wooden groin at Joseph Sylvia State Beach on Martha’s Vineyard. Longshore transport of sediment along the coast becomes an issue when structures, such as this, interfere with the natural movement of sediment.

organizational guidance and drafted sections of the proposal for two towns in Barnstable County that received FY14 Coastal Community Resilience Grants totaling over \$230,000 to increase coastal resilience. The Town of Barnstable received funding (\$68,000) to prepare an application for a community rating system (CRS) for the National Flood Insurance Program, as well as a template and transferable outreach materials that other communities can utilize. Provincetown received funding (\$169,000) to perform a Coastal Resiliency Assessment and Strategic Beach Stabilization Project that will allow for a better understanding of sediment transport and the amount of material available for beach nourishment at a town-wide scale.

Woods Hole Sea Grant's Outreach and Education Program (WHSGOEP) works with its target audiences—educators, students, coastal decision makers, citizens and research scientists and engineers—to provide them with



WHSG workshops attract teachers from across New England and always contain a hands-on activity.

the tools they need to make connections between ocean science information and ocean and coastal issues. The program is guided by the following objectives: (1) educators have access to ocean science content, including Sea Grant research results, and understand how to use this information to convey scientific concepts; (2) students have access to ocean science research and information to develop an appreciation for the oceans and an awareness of marine science related opportunities; (3) citizens have access to Sea Grant research applicable to their interests and needs; (4) coastal decision-makers have access to the results of Sea Grant research and other research to increase their ability to design and develop environmentally sound policies; and (5) research scientists and engineers from the ocean science community have access to and participate in educational and outreach opportunities.

WHSGOEP relies on MOGG for input and advice on communication and educational activities. With participation by several MOGG members, WHSGOEP has developed and implemented educational programs designed to encourage users of our marine and coastal resources to explore, understand, and appreciate the value of these resources. Woods Hole Sea Grant also participates in the Massachusetts Coastal Training Program (CTP), a unique, federal-state partnership to provide science-to-management training opportunities that address the

challenges facing coastal communities. A partnership of the Waquoit Bay National Estuarine Research Reserve (WBNERR), Massachusetts Coastal Zone Management (CZM) and Woods Hole Sea Grant, CTP provides support, training and technical information to communities, organizations, and agencies so that they can better manage the coastal resources that contribute to the economic and aesthetic vitality of coastal communities in Massachusetts.

Outreach and education staff contributes to regional planning and outreach activities for the Northeast Sea Grant Consortium, the New England Ocean Science Education Collaborative (NEOSEC), *Coastweek* activities sponsored by the Massachusetts Office of Coastal Zone Management, and the annual Cape Coastal Conference that includes sponsorship by Woods Hole Sea Grant, Waquoit Bay National Estuarine Research, Massachusetts Department of Conservation Reserve, the Cape Cod Commission, Three Bays Preservation, Inc., the Center for Coastal Studies, Cape Cod Community College, the Massachusetts Bays Program, the Association to Preserve Cape Cod, and the Massachusetts Office of Coastal Zone Management.

Outreach

The impact of marine debris on the shoreline of southeastern Massachusetts continues to be pervasive, but Woods Hole Sea Grant has quickly become one of a limited number of organizations in New England dedicated to regular efforts mitigating those impacts, educating the public about the issue, and working toward developing new tools and technologies to limit losses at the source during 2014. WHSG conducted seven cleanups for a variety of groups, from a college alumni association to a senior citizen group, attracting more than 150 attendees and collecting 211 pounds of trash. Highlights included a clean up by the Falmouth High School ceramics class, which collected 35 pounds of garbage from 0.70 of a mile and then turned the garbage into a sculpture that was displayed in town.

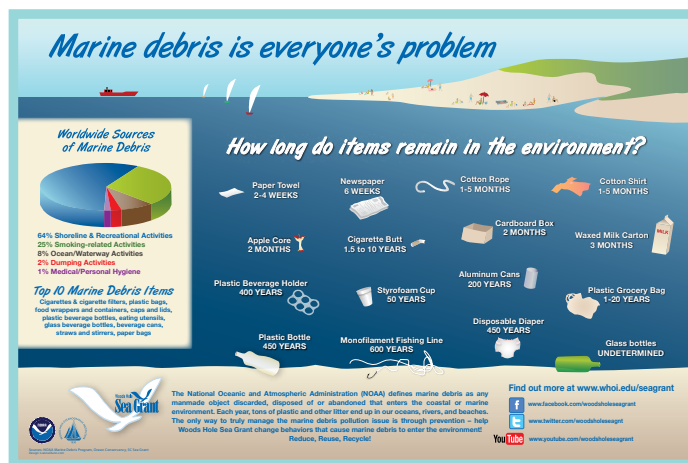
The program is also partnering with the Virginia Institute of Marine Sciences (VIMS) on *in situ* testing of a newly developed biodegradable escape vent panel for lobster traps, which if successful would decrease the yearly number of lost traps, currently estimated at 38,694 at the estimated rate of 10 percent for all 386,948 traps set by the 1,206 commercial lobster license holders in the MA commonwealth in 2012.

Sea Grant messaging on coastal ecosystem awareness is featured on interpretive displays along the Shining Sea Bike Path in Falmouth, one of the most popular attractions on Cape Cod. Curling nearly 11 miles past woodlands, marshes, salt ponds and seascape, the Shining Sea Bikeway is the only bikeway on Cape Cod to skirt the shore. The paved trail extends from County Route 151 in Falmouth to the Woods Hole Steamship Authority's site in Woods Hole. Sea Grant messaging on healthy coastal ecosystems, and safe and sustainable seafood supply, along with outreach tidbits on an accompanying map and brochure, exposes Sea Grant efforts to the bike path's average of 500 daily visitors, or 182,000 for a year.

Woods Hole Sea Grant is also reaching new audiences by leading local marine education and awareness efforts in Geocaching, a fast-growing recreational activity in which participants use a GPS or mobile device and other navigational techniques to hide and seek containers, called "geocaches" or "caches." The caches contain information on the region and tips for sustaining the environment and can be modified quickly to highlight areas of concern in that spot, such as erosion issues, sea-level rise, etc.

Education

For Woods Hole Sea Grant's education programs, examples of stakeholder engagement include: (1) The long-running *Topics in Oceanography* workshops attract teachers from Cape Cod, Southeastern Massachusetts, the Greater Boston area, Western Massachusetts, Rhode Island, Connecticut, New Hampshire, and Vermont; these workshops provide teachers with interactions with WHOI researchers and access to post-workshop resources, and the impact is multiplied by the numbers of classes each workshop participant teaches. From the scientists'



Shellfish course student on a field trip learns how to plant quohogs.



Driving a core into Little Sippewissett Marsh, West Falmouth, during a workshop on ancient storms and climates.

perspectives, bringing teachers and WHOI scientists together provides opportunities for outreach/broader impacts aspects of research proposals. (2) Working with WHOI biologist Stace Beaulieu on her NSF-funded informal education project “Global Viewports,” Kate Madin helped to plan and advertise a workshop jointly with the New Bedford Ocean Explorium that brought New Bedford science teachers to both the Explorium and WHOI, introducing teachers with students from underrepresented populations to these two resources for ocean science.

(3) Kate also works with the Woods Hole Science and Technology Education Partnership, to introduce Falmouth teachers to WHOI physical oceanographer Claudia Cenedese’s multi-day open house (supported by internal WHOI funding) in the WHOI Geophysical Fluid Dynamics Laboratory, with demonstrations and hands-on activities illustrating water movements such as vortices, waves and currents. (4) Greg Berman, Coastal Processes Specialist, partnered with Kate Madin in presenting a recent workshop taking Cape Cod

teachers to several beaches to view coastal erosion and processes including sea level rise on Cape Cod. The teachers will use this field experience, plus the web-based resources and activities provided, in their classrooms when teaching about this local area. (5) Diane Murphy, Fisheries & Aquaculture Specialist, teams with fellow Marine Resource Specialists Joshua Reitsma and Abigail Archer to provide a recurring 8-week course *Fundamentals of Shellfish Farming* for a diverse stakeholder audience interested in gaining an in-depth understanding of shellfish aquaculture, covering topics from shellfish biology to site selection, husbandry, safety, and permitting. Course graduates have included shellfish growers, State fisheries biologists and regulators, local municipal resource managers, and persons seeking information to initiate their own aquaculture business.

Collaborative Network/NOAA Activities

Northeast Sea Grant Regional Collaborations

The Northeast Sea Grant Consortium (NESGC) includes the Sea Grant programs in Maine, New Hampshire, Massachusetts (Woods Hole and MIT), Rhode Island, Connecticut, and New York. The Consortium was formed in 2009 to address regional stakeholder concerns, advance research, education, outreach, and diversity of programming for regional projects, and seek additional funds to support regional projects. NESGC has supported regional activities in the Gulf of Maine and Long Island Sound, collaborated with the Northeast Regional Ocean Council (NROC), and interacted with both NROC and the Bureau of Ocean Energy Management (BOEM) in identifying regional information needs.

Success in National Competitions

Woods Hole Sea Grant is responsible for managing research and fellowship competitions that are funded through the National Sea Grant Office, such as the Dean John A. Knauss Marine Policy Fellowship, the NOAA Coastal Management Fellowship, and the NOAA Fisheries/Sea Grant Graduate Fellowship. In addition, we assist in administering the Northeast Regional Social Science Research and the National Strategic Initiative (NSI) competitions. From 2010-2015, Woods Hole Sea Grant has supported ten Knauss Fellows, two NSI awards in aquaculture extension and research, six Northeast Regional Social Science Research Awards, and three NSI awards in social science.

NOAA Activities

Woods Hole Sea Grant has supported the following NOAA activities:

Sea Grant Network

Sea Grant Association delegate, Judith McDowell

Louisiana Sea Grant Site Review Team (2011), Judith McDowell

Northeast Sea Grant Consortium, 2009-present, Judith McDowell, Chair, 2013

Rhode Island Sea Grant Technical Review Panel (2013), Diane Murphy

MIT Sea Grant Technical Review Panel, 2010-2015, Judith McDowell

MIT Sea Grant State Advisory Committee, 2010-2015, Judith McDowell

Steering Committee “Supporting cost-efficient adaptation” (2012-2013), Greg Berman

Improving Climate Literacy in the North Atlantic: a Partnership between NOAA’s North Atlantic Regional Team and the Sea Grant Network (2010), Greg Berman

Sea Grant Communications network, Jeffrey Brodeur and Abigail Archer

Sea Grant Communications subcommittee on marketing, Jeffrey Brodeur

Planning Committee for 2013 Northeast Sea Grant Regional Meeting, Jeffrey Brodeur

Planning Committee for 2015 Northeast Sea Grant Regional Meeting, Abigail Archer

Association of Sea Grant Extension Program Leaders (ASGEPL), Diane Murphy

Sea Grant Fisheries Extension Network, Diane Murphy

Sea Grant Social Science Community of Practice, Diane Murphy and Jeffrey Brodeur

Sea Grant Extension Assembly (SGEA) member, Diane Murphy

Other NOAA Activities

Advisory board for Cooperative Institute for the North Atlantic Region (CINAR), Judith McDowell

NOAA NWS Marine Advisory Board, Greg Berman

Voices from the Fisheries, Abigail Archer

Waquoit Bay National Estuarine Research Reserve, Advisory Committee, Judith McDowell

Bay Watershed Education and Training (B-WET) Grant Proposal Review Panel, Jeffrey Brodeur

Interactions with other Federal Organizations and State/Regional Organizations

Massachusetts Ocean Management Task Force, Judith McDowell

Gulf of Maine Research Institute, Science Advisory Board, Judith McDowell

National Research Council, Committee on Ecological Risk Assessment under FIFRA and ESA, Board on Environmental Studies and Toxicology, Judith McDowell (Chair)

Northeast Sea Grant Consortium representative to the Northeast Regional Ocean Council (NROC) and

Northeastern Regional Association of Coastal and Ocean Observing Systems (NERACOOS), Judith McDowell

NSF/NIEHS Center for Oceans and Human Health at WHOI, Advisory Board, Judith McDowell

MEMA State Hazard Mitigation Interagency Committee, Greg Berman

State Rapid Response Coastal Storm Damage Assessment Team, Greg Berman

No Adverse Impact How To Guide, Association of State Floodplain Managers Writing Team (2013), Greg Berman

American Fisheries Society, Estuaries Section, president and governing board, 2013 to present, Abigail Archer
American Fisheries Society and American Society of Civil Engineers Joint Committee on Fisheries Engineering and Science, 2011 to present, Abigail Archer
Technical Advisory Committee (NRAC-TAC), Diane Murphy
Massachusetts Aquaculture Association (MAA), Diane Murphy
Northeast Sea Grant Extension Leaders, Diane Murphy
Northeast Regional Aquaculture Center Extension Network (NRAC-NAEN), Diane Murphy
Wellfleet Shellfish Research Committee, Diane Murphy
Coastal Resources Committee, Diane Murphy and Greg Berman
AmeriCorps Cape Cod, Advisory Board, Diane Murphy
Barnstable County Shellfish Advisory Committee, Diane Murphy and Josh Reitsma
Northeast Regional River Herring Group, Abigail Archer
Sponsorship of Northeast Aquaculture Conference and Exposition 2013 and 2015
Sponsorship of the Gordon Conference on Oceans and Human Health, 2014

Program Changes Since Previous Review

Since the 2010 review Woods Hole Sea Grant staff implemented all of the recommendations from the Woods Hole Sea Grant Site Review Team (see recommendations and actions taken listed below). In addition, Jeffrey Brodeur was promoted to Communication and Outreach Director for Woods Hole Sea Grant, a position that reflects his communication and administrative responsibilities. Jeffrey serves as second in command to the Director of Woods Hole Sea Grant for all administrative functions and meets regularly with WHOI's Communication Department.

Additional staff changes include the addition of Abigail Franklin Archer to Cape Cod Cooperative Extension staff as a Marine Resource Specialist. Abigail brings expertise in fisheries biology and fisheries management; was a Knauss Fellow with the National Marine Fisheries Service (Class of 2009); continued as a fishery policy analyst with NMFS; and was restoration project manager for the Cape Cod Conservation District in restoring fish ladders for river herring before joining Cape Cod Cooperative Extension.

Actions Taken in Response to 2010 SRT Recommendations:

Update of Woods Hole Sea Grant Strategic Plan

Woods Hole Sea Grant Strategic Plan was updated for 2011 through 2014 and a new Strategic Plan was developed for 2014 through 2017.

Appointment of Deputy Director to facilitate transition upon Judith McDowell's retirement

Dr. Matt Charrette of the Marine Geochemistry Department is interested in assuming the role of Woods Hole Sea Grant Director in 2017. With support from WHOI, Matt will assist in the planning, review, and preparation of the 2016-2018 Omnibus Proposal. He will also meet with current Sea Grant staff to become more familiar with programs and initiatives. Matt has been actively involved in Sea Grant-funded research on groundwater chemistry through Sea Grant programs at Rhode Island, Woods Hole, and MIT.

Coordinate Sea Grant Extension activities within the Commonwealth of Massachusetts with MIT Sea Grant

Sea Grant Extension staff from both programs meet periodically to identify collaborative and complementary programs. Examples of joint activities since 2010 include: (a) cooperation on planning of the Northeast Regional Sea Grant meeting held in November 2013 with themes focusing on climate adaptation and socio-economic studies of coastal resilience; (b) writing and production of *Massachusetts Homeowner's Handbook to Prepare for Coastal Hazards*, now in its 2nd edition; (c) collaboration on projects related to coastal inundation, climate adaptation and coastal processes; (d) co-sponsorship of Blue Lobster Bowl and 2014 Regional Climate Change Symposium; (e) collaboration on communication and outreach projects; and (f) meeting with Knauss Fellows to discuss Sea Grant programs before they start their fellowship year and engaging them in local activities as their time permits.

Woods Hole Sea Grant staff should attend the 2011 Sea Grant Academy

Both Jeffrey Brodeur and Greg Berman attended the 2011 Sea Grant Academy, and Joshua Reitsma and Abigail Archer attended the 2015 Sea Grant Academy.

Woods Hole Sea Grant staff should become more involved in national network activities

See list of activities under Collaborative Network/NOAA Activities.

Actions Taken in Response to 2010 SRT Suggestions:

Extension and Outreach staff should become more involved in selected research projects from the outset

During the proposal review a process is now in place to identify opportunities for collaboration between research investigators and extension staff. Many of the investigators supported within the Healthy Coastal Ecosystems theme area collaborate with staff at WBNERR and contribute to the long-term understanding of changes in nutrient dynamics and ecosystem response in Waquoit Bay and other coastal embayments. Investigators supported within the Sustainable Fisheries and Aquaculture theme directly complement the work of Woods Hole Sea Grant extension staff in fisheries and aquaculture, primarily with shellfish, shellfish predators, and river herring. Investigators within the Resilient Communities and Economies theme address practical issues of shoreline erosion and storm resilience with Woods Hole Sea Grant extension staff in coastal processes, in addition to issues related to coastal economies and decision-making with staff at WBNERR, MA CZM, and the Northeast Regional Ocean Commission (NROC). Opportunities under the Environmental Literacy and Workforce Development theme include support for undergraduate and graduate students, teacher workshops for K-12 teachers, and networking with marine educators through organizations such as the Massachusetts Marine Educators and the New England Ocean Science Education Collaborative (NEOSEC). At NEOSEC's 2014 Ocean Literacy Summit, several of the speakers were scientists and extension staff supported by Woods Hole Sea Grant. Other venues for presenting the results of research and extension programs include WHOI-sponsored events for the public on ocean acidification (2012), aquaculture (2013), and climate adaptation (2014); WHOI-sponsored summer lecture series, *Science Made Public*; *Cape Cod Coastal Conference*.

Coastal Processes project should establish an advisory group

Advisory group established in 2010.

Appendix

Staff Biographies

Judith E. McDowell is a Scientist Emeritus at the Woods Hole Oceanographic Institution where her research and teaching career in the Biology Department spans four decades. She has been director of Woods Hole Sea Grant since 1993, and in that capacity has supported research and outreach opportunities at colleges, university, and nonprofit organizations throughout the Commonwealth of Massachusetts. Judith received her undergraduate degree in Biology from Stonehill College and her M.S. and Ph.D. degrees in Zoology from the University of New Hampshire. She is also a Pew Fellow in Conservation and the Environment. Her research interests focus on the physiological ecology of marine animals and the effects of chemical contaminants in coastal ecosystems. She has served on numerous national and international committees and working groups on healthy coastal ecosystems and has led several studies for the National Research Council, including *Assessing Risks to Endangered and Threatened Species from Pesticides*, published in 2013. Judith chaired the Northeast Sea Grant Consortium in 2013 and managed the RFP and review for socioeconomic proposals for the 2014-2016 Omnibus. She also contributes to activities of the Sea Grant Association, the Northeast Regional Ocean Council, Sea Plan (formerly Massachusetts Ocean Partnership) for marine spatial planning, the Massachusetts Coastal Training Program, the Waquoit Bay National Estuarine Research Reserve (advisory board), the Gulf of Maine Research Institute, the Gulf of Mexico Research Initiative, and the National Research Council, Board on Environmental Science and Technology and Ocean Studies Board.

Jeffrey Brodeur is the Communications and Outreach Specialist for Woods Hole Sea Grant, where he is responsible for all aspects of media relations, external affairs, marine project development, and program administration for the \$1 million research, outreach and education program hosted by the nation's largest independent oceanographic research facility. As primary marine debris awareness and mitigation agent for the program, he is involved in a wide-range of projects and efforts to limit impacts of derelict fishing gear, boat shrink-wrap and other coastal and benthic debris. Brodeur has spent most of his career in communications and public affairs, serving as a reporter and editor for the Associated Press, manager of public relations at the American Red Cross in Philadelphia, and director of communications for the Episcopal Diocese of Pennsylvania. He is also a commissioned officer in the United States Coast Guard Reserve with assignments across a wide-range of mission areas during his career, including search and rescue, maritime law enforcement, public affairs and operational planning and resources. He is an active member of the national Sea Grant communicators network, recently serving on the SGA-appointed Strategic Communication subcommittee that reviewed and selected a firm to assist in increasing awareness of Sea Grant's efforts across a wide range of stakeholders. He also participates in meetings of the Northeast Regional Ocean Council and the Dukes County Barrier Beach Task Force and frequently serves in an advisory capacity for the Waquoit Bay National Estuarine Research Reserve. He is a member of the national Science Communications and Marine Public Information group (SCAMPI), American Fisheries Society, the National Shellfisheries Association and the Sea Grant Social Science Community of Practice.

Diane Murphy is the Fisheries and Aquaculture Specialist for the Woods Hole Sea Grant and Cape Cod Cooperative Extension Marine Programs. Specializing in shellfish fisheries, management, restoration and private culture, her additional foci include other coastal living marine resources such as eelgrass. She earned her Master's degree in Biology/Environmental Science from Western Connecticut State University and undergraduate degree from Pace University. She has worked as an extension agent on Cape Cod since 1999 and she is also the technical advisor to the Southeastern Massachusetts Aquaculture Center (SEMAC). Before relocating to Cape Cod, Diane worked in New York for the American Museum of Natural History and Wildlife Conservation Society as an archivist and field biologist specializing in herpetology. Diane contributes to the activities of AmeriCorps Cape Cod, the Barnstable County Shellfish Advisory Committee, the Cape Cod Conservation Commission Network, the Cape Cod Coastal Resources Committee, the Wellfleet Shellfish Research Committee, the East Coast Shellfish Growers Association, the Massachusetts Aquaculture Association, the Massachusetts Lobstermen's Association, the Massachusetts Shellfish Officers Association, the Northeast Sea Grant Extension Leaders, the Northeast Regional Aquaculture Center Extension Network and Technical Advisory Committee, the Northeast Regional Ocean Council, the Northeast Aquaculture Conference and Exposition, Sea Plan (formerly Massachusetts Ocean Partnership), the Southeastern Massachusetts Aquaculture Center, NOAA's Sea Grant Aquaculture Extension and Technology Transfer, the National Shellfisheries Association, Sustainable Agriculture Research and Education (SARE), the Nature Conservancy, the Sea Grant Fisheries Extension Network, and the Sea Grant Social Science Community of Practice.

Kate Madin is the Woods Hole Sea Grant Educator. She holds B.S., M.A., and Ph.D. degrees in zoology from the University of California at Davis, and has participated in ocean research cruises. At Sea Grant she developed (with the WHOI Information and Academic Programs Offices) and implemented a series of professional development workshops for teachers called "Topics in Oceanography." She recruits WHOI researchers as presenters, advises them on presentations, prepares resources and classroom activity material for teachers, leads the workshops and does evaluations. To date she has held 27 workshops covering 49 topics and bringing educators together with 57 scientists. Kate was on the COSEE-New England Steering Committee and helped develop its document on Ocean Literacy. She is in the Sea Grant Educators Network and has participated in activities of the Woods Hole Science and Technology Education Partnership, the Massachusetts Marine Educators, and the New England Ocean Science Education Collaborative. She is K-12 coordinator in the Woods Hole Oceanographic Academic Programs Office, and in 2014 worked with another APO staff member on a summer camp oceanography curriculum. In 2014 she also worked with WHOI biologist Stace Beaulieu and other WHOI and New Bedford Ocean Explorium personnel on Beaulieu's NSF-funded informal education project ("Global Viewports") about the effectiveness of spherical displays and docent-led presentations for teaching the public about hydrothermal vents. She is also a writer/editor with the WHOI Communications Department, writing for WHOI's magazine, *Oceanus*. Previously she was the WHOI liaison for the production of eight children's books about oceanography and co-authored one other children's book on ocean animal plankton.

Staff Biographies continued on next page.

Gregory Berman is the Coastal Processes Specialist for Woods Hole Sea Grant. He earned his Bachelor of Science in Marine Geology from Eckerd College and his Master of Science in Geological Oceanography from the University of South Florida. He became a Certified Professional Geologist (PG) in 2006 and a Certified Geographic Information Systems Professional (GISP) in 2009. Greg provides technical assistance and extension education programs for coastal communities on topics including shoreline change, erosion control alternatives, coastal landform delineation, potential effects of various human activities on coastal landforms, coastal floodplains, coastal hazards and hazard mitigation analyses, sea level rise, storm surge, dune restoration techniques, and other coastal resources management issues. Greg contributes to the activities of the Massachusetts Hazard Mitigation Interagency Committee, the Rapid Response Coastal Storm Damage Assessment Team, the Barnstable County Coastal Resources Committee, the Pleasant Bay Alliance, the Dukes County Barrier Beach Taskforce, the National Weather Service Marine Advisory Board, the NOAA North Atlantic Regional Team, the NOAA NCDC Regional Climate Services, and NOAA's Cooperative Institute for Mesoscale Meteorological Studies/ National Severe Storm Laboratory.

Joshua Reitsma is a Marine Resource Specialist with Woods Hole Sea Grant. He received his undergraduate degree in environmental science with emphasis in aquaculture and ecology from Unity College in Maine and his Master's degree in Fisheries, Animal and Veterinary Sciences from the University of Rhode Island with thesis work focusing on gene regulation of muscle growth as Atlantic salmon transform from parr to smolt and experience a rapid increase in growth. Before joining Cape Cod Cooperative Extension and Woods Hole Sea Grant, Josh held several positions in fisheries management and aquaculture, including working as hatchery manager for a small coastal marine finfish farm. He also worked as a technician with the US Fish and Wildlife Service surveying the overall health of commercially and environmentally important salmonid stocks in Northern California; with the State of Connecticut Atlantic salmon restoration program; with the Alaska Department of Fish and Game commercial salmon escapement assessments, large pelagic marine fisheries surveys, and with the trout stocking program in the state of Maine. Josh focuses on assistance to the shellfish and land based aquaculture producers in MA, coastal fisheries and local shellfish enhancement programs, and local marine water quality monitoring. Josh contributes to the activities of the World Aquaculture Society, American Fisheries Society, Massachusetts Aquaculture Association, Massachusetts Shellfish Officers Association, National Shellfisheries Association, and the Barnstable County Shellfish Advisory Committee.

Abigail Franklin Archer is a Marine Resource Specialist with Woods Hole Sea Grant. She received her undergraduate degree in natural science from Hampshire College in Amherst, MA, and her Master's degree in Wildlife and Fisheries Conservation from the University of Massachusetts, Amherst with thesis work focusing on evaluation of river herring passage through nature-like and technical fishways. In 2009 she was a John A. Knauss Sea Grant Marine Policy Fellow sponsored by MIT Sea Grant Program and she spent her fellowship year working with NOAA's National Marine Fisheries Service, Office of Sustainable Fisheries, Domestic Division, in Silver Spring, MD. Abigail coordinates the River Herring Network, a professional society for river herring wardens on Cape Cod and Southeastern MA; participates in the Planning Committee for the State of Wellfleet Harbor Conference, serving as of the conference moderator in 2013 and 2014; and is a member of the Barnstable County Shellfish Advisory Committee. She is also a board member for the American Fisheries Society, Southern New England Chapter, and president of the Estuaries section of the American Fisheries Society.

Woods Hole Oceanographic Institution Sea Grant Program

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